

What is claimed is:

- Sub 101
- 5
1. An aircraft, including:
a wing having a trailing edge and deflectable control surfaces located along the trailing edge, the wing being capable during flight of generating a normal lifting force having a spanwise force distribution across the wing; and
a control surface reconfiguration system which reconfigures the control surfaces to optimize the spanwise force distribution for each of a plurality of different flight conditions.
- 10
2. The aircraft as set forth in Claim 1, wherein:
the lifting force generates a moment acting on the wing; and
the control surface reconfiguration system also minimizes the moment for at least one of the different flight conditions.
- 15
3. The aircraft as set forth in Claim 2, wherein:
the control surface reconfiguration system minimizes the moment for structurally crucial flight conditions.
- 20
4. The aircraft as set forth in Claim 1, wherein the control surface reconfiguration system also trims the wing.

5. The aircraft as set forth in Claim 1, wherein:

one of the different flight conditions comprises cruise, with the wing having a lift-to-drag ratio during cruise; and

5 the control surface reconfiguration system functions to maximize the lift-to-drag ratio of the wing during the cruise flight condition.

Sub 10 6. The aircraft as set forth in Claim 1, wherein:

the wing includes a plurality of chord lines;

10 one of the different flight conditions comprises high lift at low speed; and,

the control surface reconfiguration system functions to maximize the spanwise lifting force without causing stall to occur at any of the chord lines when the wing is in the high lift at low speed flight condition.

15 7. The aircraft as set forth in Claim 1, wherein:

one of the different flight conditions comprises a pitch maneuver; and,

the control surface reconfiguration system functions to achieve the required lifting force during the pitch maneuver flight condition.

20 8. The aircraft as set forth in Claim 7, wherein:

the aircraft has a longitudinal axis of symmetry; and,

the control surface reconfiguration system functions to shift the spanwise force

distribution towards the longitudinal axis without reducing lifting force, during the pitch maneuver flight condition.

5 9. The aircraft as set forth in Claim 1, wherein the aircraft is a blended wing-body aircraft.

10. The aircraft as set forth in Claim 1, wherein the different flight conditions include cruise, takeoff, and pitch maneuvers.

10 11. An aircraft, including:
a wing having a trailing edge and deflectable control surfaces located along the trailing edge, the wing being capable during flight of generating a normal lifting force having a spanwise force distribution across the wing; and,
reconfiguration means for reconfiguring the control surfaces to optimize the spanwise force distribution for each of a plurality of different flight conditions.
15

12. The aircraft as set forth in Claim 11, wherein:
the lifting force generates a moment acting on the wing; and,
the reconfiguration means functions to minimize the moment for at least one of
20 the flight conditions.

13. The aircraft as set forth in Claim 11, wherein:

the control surface reconfiguration system minimizes the moment for the structurally crucial flight conditions.

14. The aircraft as set forth in Claim 11, wherein the reconfiguration means also trims the wing during flight.

15. The aircraft as set forth in Claim 11, wherein:

one of the different flight conditions comprises cruise, with the wing having a lift-to-drag ratio during cruise; and,

the reconfiguration means functions to maximize the lift-to-drag ratio during the cruise flight condition.

16. The aircraft as set forth in Claim 11, wherein:

the wing includes a plurality of chord lines;

one of the different flight conditions is high lift at low speed; and,

the reconfiguration means functions to maximize the spanwise lifting force without causing stall to occur at any of the chord lines during the high lift at low speed flight condition.

17. The aircraft as set forth in Claim 11, wherein:

one of the different flight conditions comprises a pitch maneuver; and,
the reconfiguration means functions to maximize the lifting force during the pitch
maneuver flight condition.

- 5 18. the aircraft as set forth in Claim 16, wherein:
the aircraft is a blended wing-body with a longitudinal axis of symmetry; and,
during the pitch maneuver, the reconfiguration means functions to shift the
spanwise distribution towards the longitudinal axis without reducing the lifting force.

10 19. A method for controlling flight of a blended-wing aircraft which includes a wing
having a trailing edge and control surfaces located along the trailing edge which are
deflectable in upward and downward directions, the wing being capable during flight of
generating a normal lifting force having a spanwise distribution across the wing, the
method including the steps of:

15 reconfiguring the control surfaces upwardly or downwardly as required to
optimize the spanwise force distribution for each of a plurality of different flight
conditions, and to simultaneously control trim.

20 20. The method as set forth in Claim 19, including the step of reconfiguring the
control surfaces to control trim of the aircraft.